Probabilistic Graphical Models: Towards Integration with Deep Learning

Seung-Hoon Na

Chonbuk National University

Contents

- Intro to Bayesian machine learning
  - Murphy's book   https://www.nature.com/articles/nature14541.pdf
- PGM: Representation
  - Bayesian network, Markov random fields
- PGM: Inference
  - Exact inference
    - Variable elimination, Junction tree algorithm
  - Variational inference
  - Makov chain Monte Carlo method
- PGM: Learning
  - Bayesian learning
  - Structure learning

Contents

- PGM for reinforcement learning
- Generative models
  - Auto encoder-decoder
- Deep generative models
  - Variational auto-encoder
  - Generative Adversarial network
  - Wasserstein GAN
  - Autoregressive networks

Contents

- Advanced topics
  - Bayesian Deep Learning
  - Disentangled Representation Learning
  - Meta-learning
  - Capsule Networks
  - Quantum Machine Learning

Goal

- Understand Bayesian machine learning
- Understand representation/inference issues for PGM
- Understand deep generative models
- Get some insight on hybrid approach of PGM & Deep learning
- Catch up some recent topics in machine learning

References

- D. Koller and N. Friedman, Probabilistic Graphical Models: Principles and Techniques, MIT Press, 2009

- Kevin Patrick Murphy, Machine Learning: a Probabilistic Perspective, MIT Press, 2012

- I. Goodfellow, Y. Bengio, A. Courville, Deep learning, MIT Press, 2016

- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007